Abstract Submitted
for the DPP06 Meeting of
The American Physical Society

Shock-induced melting of crystalline carbon[1] P.M. CELLIERS, J.H. EGGERT, University of California/LLNL, T.R. BOEHLY, J.E. MILLER, University of Rochester/LLE, A.V. HAMZA, R.J. WALLACE, D.K. BRADLEY, G.W. COLLINS, D.G. HICKS, University of California/LLNL — One of the ablator candidates for the capsule in the NIF Ignition Campaign is chemical vapor deposited crystalline carbon with nanocrystalline grain structure. Modeling of this ablator material requires accurate knowledge of the Hugoniot equation of state and of the location of the melt transition under shock. Using a line-imaging VISAR and a streaked optical pyrometer we have measured the luminosity of laser-driven shocks as a function of shock strength in CVD crystalline carbon in the pressure range 0.6 -3 TPa. There is a clear discontinuity in the shock emission when the shock amplitude decays into the solid-liquid mixed-phase coexistence region. From these data, along with previously measured Hugoniot data, we find that shock melting occurs between 700 and 1040 GPa along the Hugoniot at temperatures 8000 -10000 K, and that the Clapeyron slope, dP/dT is negative along the melt. The latter result indicates that liquid-phase carbon is denser than solid-phase carbon at these conditions.

[1]Work performed under the auspices of the U.S. Department of Energy by the Lawrence Livermore National Laboratory under contract number W-7405-ENG-48.

P.M. Celliers
University of California/LLNL

Date submitted: 31 Jul 2006 Electronic form version 1.4